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02090262.3

Der Präsident des Europäischen Patentamts;
Im Auftrag

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Method for processing information parts of recorded data

The invention relates to a method for processing information parts of recorded data, a respective processing device and a
5 respective recording medium. There exist several media on which data to be processed can be recorded, e.g. magnetic tapes or disks, optical tapes or disks, solid state memories etc. For each of such recording media, several standards on how to record and how to organize the data exists.

10

In case of a new standard for processing, e.g. recording, data, or in case of a new upgraded version of such standards, records of recording devices working according to that new standard or version are not readable by recording devices of
15 an older version.

According to some standards version numbers are used to indicate the version of its assigned recorded information. If a device detects information indexed by a higher version
20 number than the version number supported by the device itself, then this device will reject this information, because the device does not know anything about the structure of this information. This has the effect that the device is not able to access to the information and will stop any
25 further processing of the information.

However, it is important to take care of future versions of a standard. If there is taken no care of later versions, then the behaviour of the older devices may be arbitrary in the
30 case of handling version updated information. Arbitrary behaviour of older devices, or such non-existence of forward compatibility is a big disadvantage.

It is an object of the invention to provide forward
35 compatibility.

This object is solved by the method as described in claim 1.

Recorded data consists of one or several information parts, which may be related to each other. This means that

5 processing of the recorded data in general requires different information parts to be processed, which information parts may refer to each other. Each information part may be changed in order to change or amend the recorded data without changing the other information parts. In case two information

10 parts refer to each other, changing of one of them may necessitate a change of the other in order not to destroy consistency. The rules given by a certain version of a standard take care of such necessities. Processing types are for example generating process, read process, append process,

15 i.e. to add something at a predefined location of the information part, preferably at its end, or edit process, i.e. to change the content of the information part. According to the invention an information part is processed at least by some of the available processing types, even if the available

20 processing types comply to an earlier version of the standard than the information parts. This has the advantage of forward compatibility of an older device for at least some processing types being in conformity with a newer version of a standard. Even an old device can read information parts, which were

25 created by a new device in compliance with a later version of the standard than the version to which the old device complies. However, it is prevented that the old device destroys information that complies to the later version of the standard by not permitting the old device to perform

30 append or edit processing types.

Preferably processing is done according to a version of the standard having a lower version number than the processing

35 number is lower than the processing version number. This assures correct interpretation of the information contained

in the processed information part as intended according to the old version of the standard to which the information part complies. Preferably, processing is performed according to the version of the standard identical to the information part version number. However, processing according to a version number higher than that but not higher than the processing version number is done as long as correct interpretation is assured.

- 10 Preferably, processing is permitted as long as the processing version number and the information part version number do not differ from each other about more than a predefined value. This assures limited forward control. In case that a future version of this standard cannot be designed such to guarantee compliance of a certain information part with previous versions even for those processing types for which this was possible for previous versions, then the version number of this new version of the standard is chosen such that the difference exceeds said predefined value. This allows, for example, read processing for any version of the standard while append processing might be permitted only for versions n.xx and n+1.xx for a device being in compliance with version n.00. A new version of the standard that would not guarantee compliance for the append process with older devices would, therefore, require a version number n+2.xx.

According to the invention a processed information part is provided with a new information part version number, which indicates the lowest version of the standard to which the processed information part complies before said processed information part is transmitted. This assures correct further processing of the processed information part, even if previous processing has changed some characteristics, and even if these changes are not in conformity with the version of the standard the information part previously was in conformity with. In general this will cause an increase of

the information part version number. However, there may also be a decrease of the information part version number in case that during processing, such characteristic have been removed, which made necessary compliance to a higher version of the standard. Transmission is, in this meaning, for example a transmission within the same device or to another device, by wire or wireless. The information part is transmitted for example to be displayed, to be recorded, to be further processed or to be handled in another appropriate way.

Preferably, several information part version numbers are attached to a single information part. This has the advantage that for several processing types different version numbers can be assigned thus increasing flexibility of compatibility design.

A reading and/or recording device for performing the method as described above is also part of this invention.

A recording medium according to the invention comprises information parts, which are generated according to the inventive method or a similar method. Such recording medium comprises information parts that belong to one set of recorded data, these information parts having different information part version numbers although they are related to each other to form, in combination, the recorded data.

The invention is described below in some specific examples, more details can be seen therefrom. However, also other combinations of features are covered by the invention.

In the figures

Fig. 1 shows a flowchart of an inventive method,

Fig. 2 shows a recording medium according to the invention. The rectangle "derive lowest version number" is described by fig. 3.

Fig. 3 shows a flowchart of deriving the version number for each information part. This procedure describes the rectangle "derive lowest version number" of fig. 2. In this flowchart "vn" means version number and "ip" means information part.

10 In the following there is described a definition of a version number, which provides restricted forward compatibility of a device to later versions. This is performed by a special definition of the meaning of the version number. This special definition contains restrictions for later versions. So, the
15 behaviour of later versions follows some rules. These rules guarantee the structure of information covered by information containers, e.g. descriptors, of later versions of a standard.

20 An information part, e.g. a separated file, shall contain an information part version number inv. This information part version number inv indicates the version of the encoder, which generated this information part. It is to be noted, that the encoding device may be even of a higher version
25 number than this generated version number inv. It is also possible that one device generates different version numbers inv1, inv2, ... for different information parts ip1, ip2, ...

If another device shall process such information parts, ip1, ip2, ... then it has a look for the respective information
30 part version numbers inv1, inv2, ... If the version number inv of such an information part is equal or lower than the processing version number rnv supported by the device itself, then full support of all features is provided by the device.

35

If the version number *inv* of such an information part *ip* is higher than the processing version number *rnv* supported by the device itself, then the device does support only restricted access to the information part *ip* and assigned data and information. This restricted access means, that the access is for example restricted to only read processing, e.g. playback, for the information part and its assigned data or to read processing and restricted write processing, e.g. append new information and data, of the information part and its assigned data. Restricted write processing means, that a change of the information part or assigned data and information are permitted to be changed in a restricted manner, e.g. to append new data or information, but prohibit a change of already recorded information and data.

15

In order to support more flexible forward compatibility preferably more than one version number indicator is provided for the same information part *ip*. For example:

20 A first version number *inv* defines the readability, e.g. for playback, of the information part *ip* for devices of later versions, and

a second version number *inv* of the same information part *ip* defines the restricted write access for edit processing, e.g. cut and change information and data, and

a third version number *inv* of the same information part *ip* defines the restricted write access for appending new information and data to the information part *ip* and its assigned information and data, and

a fourth version number indicates the actual version number of the used encoder for generating the information part. This is useful especially for devices of higher version *rnv*. They use such information for example to automatically correct, or

provide workaround(s) for, known bug(s) of this specification or known device bug(s).

The following table describes the behaviour:

5

record device version number (rnv) in comparison to the version number of the information part (inv)	read (e.g. play-back)	append (e.g. add a new recording, leave the old records unchanged)	edit (change already recorded records, e.g. delete a record)
rnv < inv -> old device	yes (1)	yes/no (3)	no (4)
rnv = inv	yes	yes	yes
rnv > inv -> new device	yes (2)	yes	yes (2)

The indication "yes" means that the respective processing type is permitted, "no" means that it is not permitted. Some limitations are indicated by (1) to (4), having the following meaning:

10

(1) But, only the features of the old version will be supported.

15

(2) The new device has to support the old version of the standard. This is necessary, because even a newer device has to be aware of the old version to be able to interpret the stored information as intended by the old version.

20

(3) This feature may be supported ("yes") or not ("no"). This depends on the level of version number difference and how strong the structure differences between the processing version number rnv of the device and the information part version number inv are.

25

(4) A change of the information part cannot be supported, because the old device does not know anything about the

additional information supported by the new version of standard. A change of the information could lead to inconsistencies inside a certain part of the information part ip, which certain part is only supported by a new device.
5 Therefore, for an old device it is strongly forbidden to change already stored information generated by a newer version of a standard.

Fig. 1 shows a flowchart on how to decide which processing
10 types are to be available for a certain information part ip.

If the actual version of the standard defines more than one information part as part of the complete information set, then a device shall, according to the invention, store each
15 information part ip with an as low as useful information part version number in order to provide as much as possible functionality and access to older devices. For example, if a higher version information part number for one information part is necessary to provide voice annotations, but no voice
20 annotations were made for this record, then the information part is stored using the format defined by the old version of the standard.

An example about how information part version numbers inv may
25 change during processing is described as follows:

A device supports exact 4 information parts ip1, ip2, ip3 and ip4, each with an information part version number inv1, inv2, inv3, inv4. The device supports the processing version number
30 rnv=3.0 and all previous processing version numbers 1.0, 1.1, 1.2, 2.0.

The history of ip1: launched with version number 1.0,
slightly changed for 1.1, not changed to 1.2, slightly
35 changed to 2.0, not changed to 3.0.

The history of ip2: launched with version number 1.0, not changed until inclusively 3.0.

5 The history of ip3: launched with version number 2.0, expanded to support optional additional information (only voice annotations are added to this version of the standard) slightly changed for version number 3.0.

10 The history of ip4: launched with version number 3.0. It contains links to the content of ip1. A change of ip1 content requires a change of ip4 information. The recording of ip4 is optional. It shall be recorded for the case that additional metadata about the record has been received (during the recording).

15

Example scenario number 1:

The record device (of version 3.0) makes a record. No voice annotations are done and no additional metadata are received.
20 The used version numbers are described by the used version numbers of the 4 information parts:

25 ip1: 2.0, because, there is no difference between ip1 of version 3.0 and ip1 of version 3.0, and no ip4 is recorded.

25

ip2: 1.0, because ip2 of version 1.0 and 3.0 are the same and there is no version dependent relation to other information parts.

30 ip3: 2.0, because no voice annotations are done, therefore version 3.0 for ip3 is not necessary

ip4: not recorded, because additional metadata were not recorded.

35

Example scenario number 2:

Start point: Result of scenario 1 (the previous scenario).
Now, the user performs (offline) a voice annotation. The used
version numbers are described by the used version numbers of
5 the 4 information parts:

ip1: 2.0 no need for a change.

ip2: 1.0, no need for a change.

10

ip3: 3.0, because only this version supports voice
annotations.

ip4: not recorded, because additional metadata were not
15 recorded.

Example scenario number 3:

Start point: Result of scenario 2 (the previous scenario).
20 Now, the user receives additional metadata for its records
(e.g. via internet). The used version numbers are described
by the used version numbers of the 4 information parts:

ip1: 3.0 Now, ip4 was recorded: A change of ip1 would lead to
25 inconsistencies related to the content of ip4. Therefore,
only a device of version 3.0 would be able to perform a
change of ip1 as necessary to keep the consistency of all
information parts.

30 ip2: 1.0, no need for a change.

ip3: 3.0, no need for a change.

ip4: 3.0, because this is the place for the additional
35 metadata. Because the (new) existence of this information
part, ip1 must be of version 3.0 to indicate that an older

device shall not edit (e.g. cut or delete) data inside ip1, because this could lead to inconsistencies between ip1 and ip4.

- 5 After the third scenario, a device of e.g. version 2.0 would be able to use ip1, ip2 and ip3 for playback and would be able to append new records and this device would be able to edit ip2 because ip2 is still marked as version 1.0. But, it is not allowed for the device to edit ip1, ip2 or even ip4.
- 10 Of course, the existence of ip4 is not known by a device of version 2.0.

Example scenario number 4:

- 15 Start point: Result of scenario 3 (the previous scenario). Now, the user removes ip4. The used version numbers are described by the used version numbers of the remaining 3 information parts:
- 20 ip1: 1.0 (now, ip4 was removed: A change of only ip1 wouldn't lead anymore to any inconsistencies between the remaining information parts. Therefore, a version 1.0 device may perform a change of ip1 if desired).
- 25 ip2: 1.0, (no need for a change).
- ip3: 3.0, (no need for a change).
- ip4: was removed

30

- It is recommended to assign automatically the highest version number used by any of the stored information parts for the recorded data, e.g. streams, which shall be controlled by the information parts. That means, that an older device will not
- 35 edit the recorded data. That keeps the consistency of the recorded data with the (newer) information parts. It is

strongly recommended to implement this rule as part of the specification.

In the case of recording, the following restriction for
5 generating the version numbers should apply:

- A format version (described by the version number) shall be used which covers all required properties (e.g. features) for this information part and
- 10 - the version number of the information part shall be as low as possible (in order to provide as much compatibility to older devices as possible) and
- in the case of related information parts exist the version number shall be chosen in a way (high enough), that the
15 version number requires an editing device, which exactly knows about the complete dependencies to the related information parts (in order to avoid inconsistencies between (however) linked information parts after editing of the information part by an older device).

20

The method, device and medium according to the invention provide (restricted) forward compatibility to higher device/medium versions. It is provided a defined behaviour of an older device, if it has to handle information of a higher
25 version number than supported by itself. A device according to the invention is able to provide restricted (e.g. playback) functionality of its records to older devices. So, a newer device is assured, that older devices will not damage the additionally stored information: This is important,
30 because only a newer device is able to understand these additional information, and to process it correctly.

The inventive concept is useable for nearly any kind of
(future) technical specification or standard. This invention
35 describes a definition of a version number, which provides restricted forward compatibility of a device to later

versions. This is performed by a special definition of the meaning of the version number. This special definition contains restrictions for later version. So, the behaviour of later version follows some rules. These rules guarantee the
5 structure of information covered by information containers (e.g. descriptors) of later specification versions. Of course, these rules should be defined in all versions of the same standard. If there is one version according to which these rules are not required, it is probably not possible to
10 guarantee forward compatibility for this version and all previous versions.

Patent Claims

- 1) Method for processing information parts (ip1, ip2,...) of recorded data () wherein each information part (ip1, ip2,...) is provided with an information part version number (ivn1, ivn2,...), said information part version number (ivn1, ivn2,...) indicating the version of a standard to which the information part (ip1, ip2,...) complies, each information part (ip1, ip2,...) may have a different version number, and processing being performed in compliance with a version of said standard being indicated by a processing version number (rnv), for processing different processing types () being available, the method having the steps of
- reading the information part version number (ivn1, ivn2,...) of an information part (ip1, ip2,...),
 - comparing the read information part version number (ivn1, ivn2,...) with the processing version number (rnv),
 - if the read information part version number (ivn1, ivn2,...) is lower than or equal to the processing version number (rnv) permitting every processing type () to be performed,
 - else permitting only some processing types () to be performed,
 - processing the information part (ip1, ip2,...) using said allowed processing types ().
- 2) Method according to claim 1, further characterised by
- performing processing for at least one processing type (ip1, ip2,...) according to a version of the standard having a lower version number than the processing version number (rnv) ~~if the read information part version number (ivn1, inv2,...) is lower than the~~

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- 3) Method according to one of the previous claims, further characterised by
- permitting a processing type () to be performed in case the information part version number (inv1, inv2,...) and the processing version number (rnv) being different but this difference not exceeding a predefined value ().
- 4) Method according to one of the previous claims, further characterised by, after processing,
- providing a processed information part (ip1', ip2',...) with a new information part version number (inv1', inv2',...), said information part version number (inv1', inv2',...) indicating the lowest version of the standard to which the processed information part (ip1, ip2,...) complies,
 - transmitting said processed information part.
- 5) Method according to one of the previous claims, characterised by
- providing different kinds of information part version numbers (inva, invb,...) to a single information part (ip) for different kinds of processing types.
- 6) Reading and/or recording device for performing the method of one of the previous claims.
- 7) Recording medium () comprising information parts (ip1, ip2,...) being generated according to the method of one of claims 1-5 or by the device according to claim 6, having different information part version numbers (ivn1, ivn2,...).

Abstract

The method, device and medium according to the invention
5 provide (restricted) forward compatibility to higher
device/medium versions. It is provided a defined behaviour of
an older device, if it has to handle information of a higher
version number than supported by itself. A device according
to the invention is able to provide restricted (e.g.
10 playback) functionality of its records to older devices. So,
a newer device is assured, that older devices will not damage
the additionally stored information: This is important,
because only a newer device is able to understand these
additional information, and to process it correctly.

15

(Fig. 1)

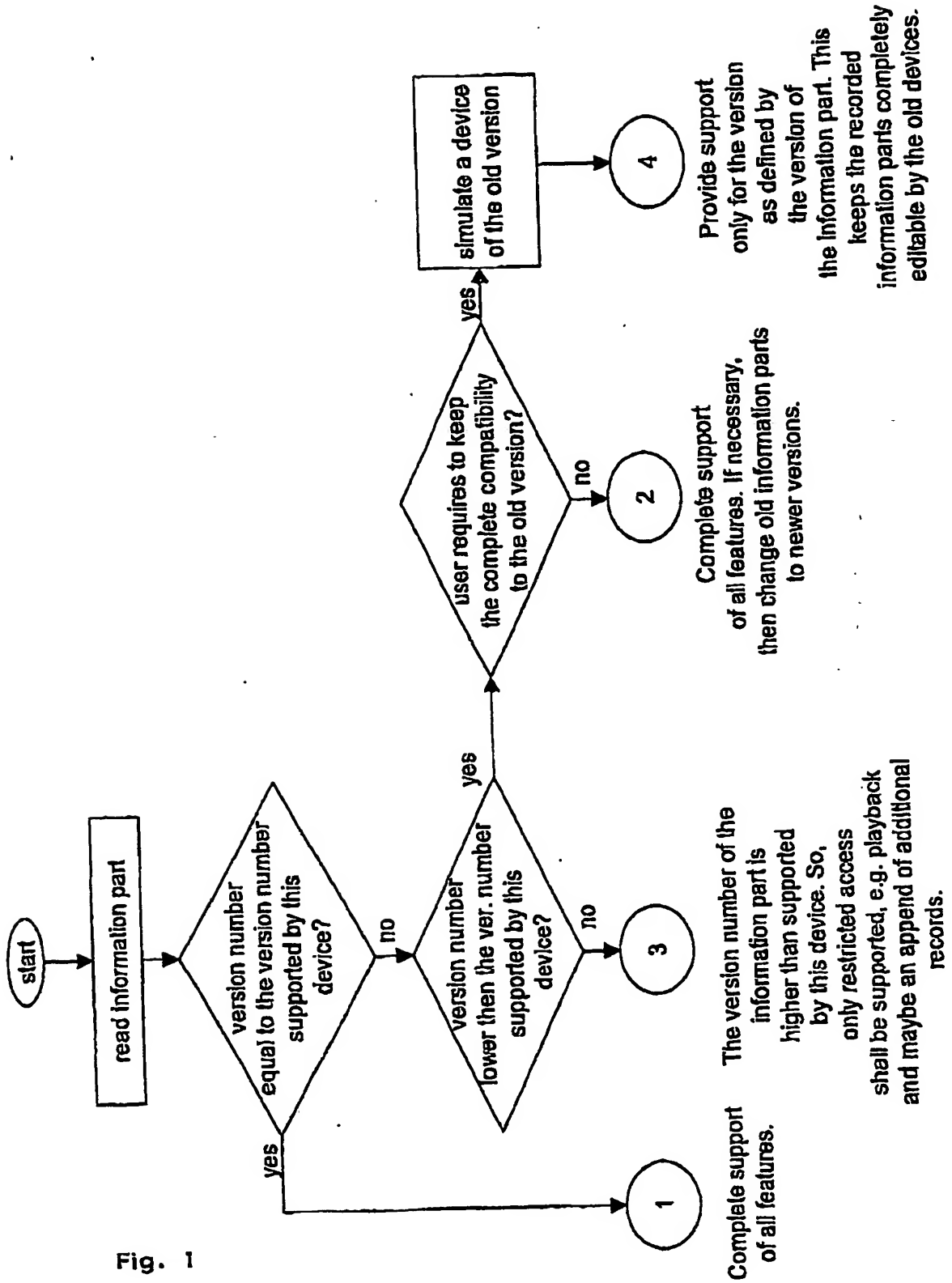


Fig. 1

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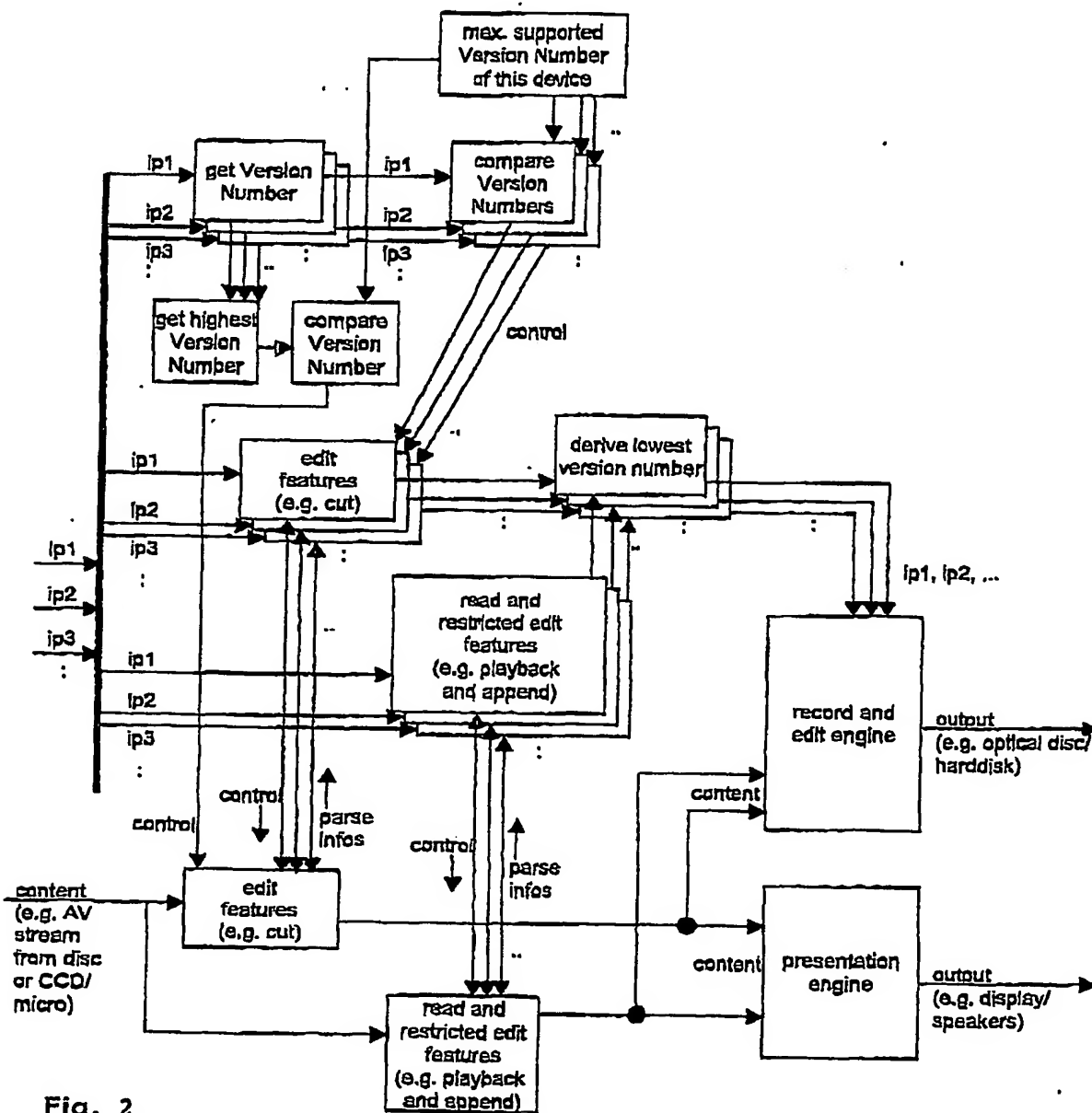


Fig. 2

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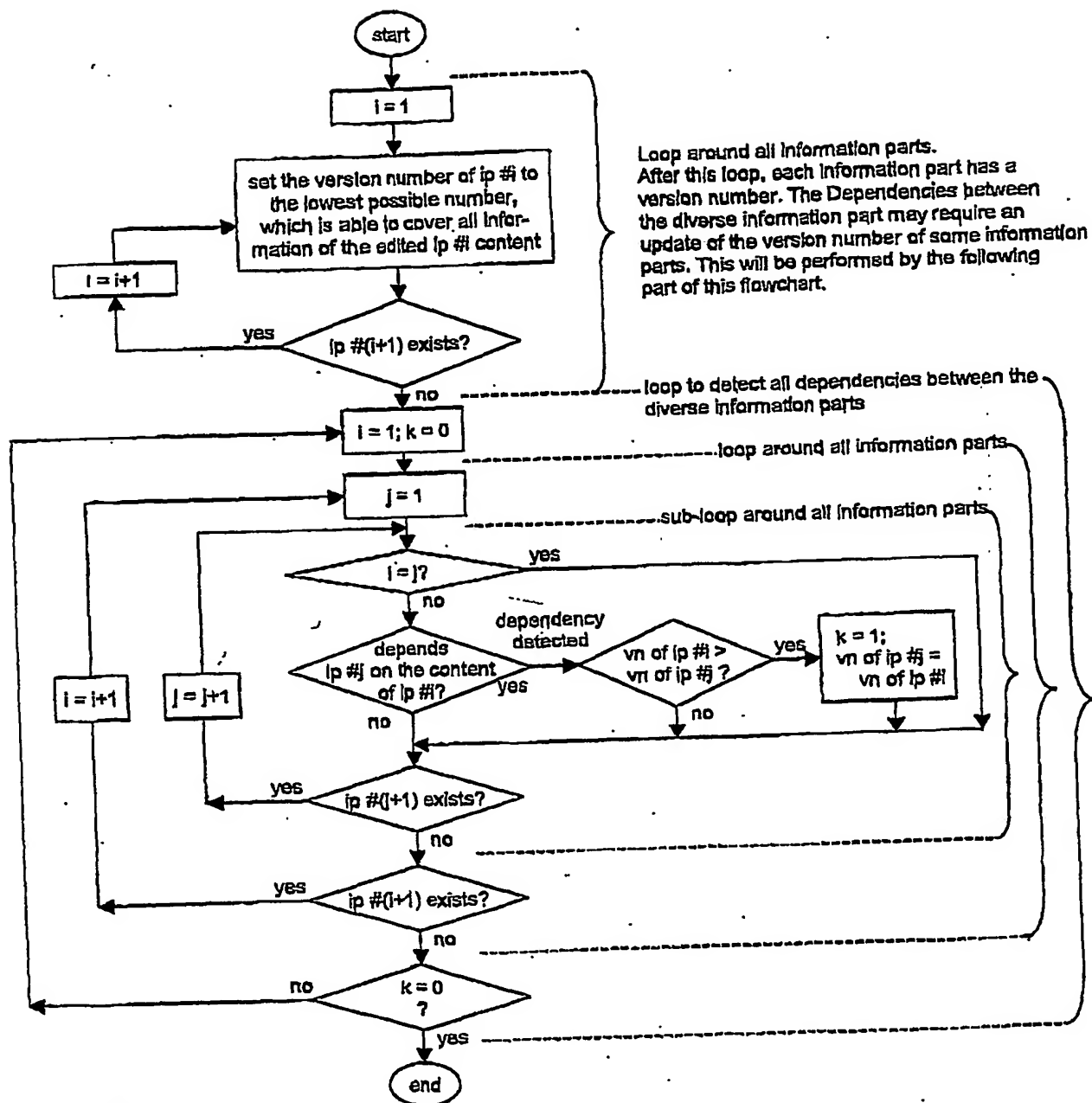


Fig. 3